Electro-Therapeutical Section.

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Dr. SAMUEL SLOAN, President of the Section, in the Chair.

On the Therapeutical Use of Static Electricity.

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MUCH honoured by the amiable invitation, I accede with great pleasure to the desire of your vice-president, Dr. Morton, to read a paper at this scientific meeting on some new applications of static electricity, especially the spark and flame discharges for therapeutical purposes. I have tried to overcome the difficulties of expressing myself in the English language, of which I have only a little experience. I invoke your indulgence with regard to my boldness in this matter. Occupied by the application of Finsen's method in a number of cases of lupus that were under my care some three years ago, I was much disconcerted regarding the great amount of money, time, and perseverance demanded both from the patients and the attendants by this method. The results obtained by the Finsen method are so splendid and so well known that I need not praise them; so it was only by the desire to meet with those drawbacks that, at the moment Dr. Suchier's method came to my notice, I felt myself obliged to give it a trial. Being in possession of a small influence machine of the Wimshurst type, I arranged it according to the prescriptions of Suchier to make some preliminary experiments, the results of which were so encouraging that I decided to study the method at the source—Dr. Suchier's clinic at Freiburg, in Baden. Three big influence machines of the Wimshurst type, each with twelve ebonite plates, with inlaid tin sectors, turning at a speed of 800 or 1,000 revolutions per minute, were at work all day and all the year round.

Even the most desperate cases of lupus were welcome here, and I was quite astonished at seeing the beautiful results, of which some photos I can show you speak volumes. Only a few months were required for this case, for which the Finsen treatment would certainly have taken two years. Not only lupus, but other skin diseases were treated in Suchier's clinic. Even cancer of the skin was not beyond his reach; innumerable were the diversity of nerve disturbances that were under static treatment.

I left Freiburg with many new suggestions and with the knowledge that the static current can be as easily managed as the galvanic or faradaic currents. I ordered a big Suchier machine, which enabled me a few months afterwards to commence the new treatment. A great drawback in the use of influence machines is their proverbial unreliability in wet weather and certain atmospheric circumstances. My machine has at this moment been in use during two years. It never failed even on the wettest days of autumn, and this in my notoriously wet country. The secret of the reliability of Suchier's machines lies in their being built within a strong enveloping case and the special means to keep the machine clean, dry and warm, and to avoid direct sunlight—conditions under which only the instrument will at any moment be at our disposal. Of course, a machine which is to be in action every working day for several hours ought to be correspondingly strong. The only failure which I have to refer to in Suchier's machines is the use of leather belts for driving the ebonite plates. These leather belts, owing to their extensibility, are the cause of a certain irregularity in the turning of the plates and consequently of an irregularity of the current. In future these belts must be eliminated. This can be arranged by substituting the set of counter-turning plates by fixed ebonite or glass ones; the turning set can then be fastened all on one turning axle. In this way a higher speed, and consequently a stronger current, can be obtained. Dr. Hulst, of Chicago, has realized this idea in a vertically-standing machine of fifty plates turning at a speed of 1500 per minute. For our purposes, however, we do not want these excessive measures.

It is not my intention to theorize on static electricity. The origin of electricity by friction, although the oldest form in which electricity is known to us, is still very obscure. We may suppose, according to the latest views of science, to which Fournier d'Albe has given a popular introduction in his book "The Electron Theory," that there are at the surface of every uncharged body a number of electrons ready to part company with the positive atoms to which they are attached. The effect

of rubbing two bodies—of which one is rich, the other poor—in such loose electrons gives the loose electrons an opportunity to pass, and so we get a charged body. Once we have a charged body, it is easy to obtain other charged bodies by influence. The ideal electro-static machine is one in which electrons can be separated from positive atoms, with an expenditure of work which can be entirely recovered in allowing the two electricities to recombine. A limit is set to the amount of electricity separated and stored in condensers by the dielectric strength of the medium. When the air or other dielectric between the coatings of a condensor is subject to a certain limiting stress, an electron breaks out from the negative coating and rushes across towards the positive coating. In doing so, it collides with a number of neutral atoms and breaks them up into ions of opposite signs. These ions practically reduce the distance between the coatings, and thereby increase the stress. This, again, leads to a rush of further electrons and positive atoms towards each other, and we have a whirl and turmoil of movements, collisions, separations and recombinations—we have the electrical discharge.

The discharges that will occupy us in this meeting are the point, the brush, and the glow discharge, by all of which the gaseous molecules they pass are split up into ions. I can show you these discharges at the machine which Dr. Morton has been so kind as to get ready for this demonstration. The first thing we want to manage the current is a metallic switch between the two poles of the machine. By flexible metallic wires, connected with isolating glass rods, we can conduct the current to the metallic electrodes, each provided with a glass or ebonite handle, allowing us to direct the spark on the spot where we want it. For the point and flame discharges our electrodes are provided with a platinum point, in order to avoid oxidation. Our electrodes can be easily sterilized in a gas or alcohol flame. Now, when the machine is working and the switch closed, we bring our electrodes in contact. By opening the switch the current passes through our wires and our electrodes, but, as the circuit still rests closed, the moving ions and electrons can recombine within the circuit. We do not perceive anything of what is happening, but as soon as we remove our electrodes from each other an air-gap is formed and a spark appears; enlarging this air-gap, our spark changes into flashes. Increasing the distance, these flashes disappear, the brush and flame discharges enter on the scene, both accompanied by a beautiful violet light. Further and further removing the electrodes, those flame discharges vanish in their turn, and the silent discharge, known as the electrical wind, occurs. In all these different discharges,

condensation of the air takes place. The silent discharge just mentioned is accompanied by the formation of ozone, the presence of which can be easily detected by a sheet of paper soaked in a solution of iodide of potassium in company with a starch solution. When we expose our paper to the electric wind, we see the paper in a few moments taking a well-known blue colour, signalling the iodine set free by the ozone with the following chemical reaction :—

$$2\,KI + O_3 + H_2O = 2\,KOH + I_2 + O_2$$

In a room in which a static machine is at work the presence of ozone is easily perceived. The aspiration of it, if the proportion is not too high, is rather agreeable and refreshing, and, however true it may be that ozone is easily decomposed when in connexion with organic substances, it certainly must be a good supply of oxygen; and some cases of phthisis incipiens being at that time under my care, I proposed some experimental inhalations. As none of the patients were in the least inconvenienced by these inhalations, I continued the experiment for months at sittings of one hour every day. All agreed they were much refreshed by it. The number of the respirations diminished very sensibly, whilst each respiration became more intensive; the aeration of the lungs seemed to be amplified. All were undoubtedly benefited by it, and in one case the accompanying fever soon disappeared. By measuring the average quantity of the ozone thus supplied, I determined a rate of about 28 mg. per cubic metre, a rate far higher than that of the air of Arcachon, the healthy effect of which on lung patients is ascribed by prominent French authors to the presence of ozone.

Another use of this silent discharge is its application as an electrical douche for different nerve disturbances, especially headache. By applying the electric "spider" as a douche on the head in a darkened room, we see the electrical discharge leave the scalp along the hairs, accompanied by minuscule sparks and flimsy violet flames; and by this observation an effect on scalp diseases really is suggested. Although I had no occasion to examine the effect on scalp diseases—e.g., tinea favus and trichophytea—yet in one case under treatment for nerve disturbance I saw a bald spot, which had existed for years, completely disappear under the influence of the static douche.

Turning towards the application of the flame discharge from a metallic point, the first thing that strikes us, when approaching so close that it comes within the reach of the respiratory organs, is an extraordinary penetrating odour, quite different from the refreshing and

agreeable odour of ozone; if we happen to inhale it, it provokes an irresistible cough. Apparently we have to do here with the production of nitrous and sub-nitrous acid resulting from the splitting up and following recombination of ions of the air components. Therefore the application of this flame to the face requires special care. Applying this violet flame to the skin of our hand, we perceive it as a cooling wind. That in reality heat is excited can easily be proved by directing the flame on a piece of paraffin or wax. Under the influence of the flame it melts. The effect on the uninjured skin, after an application of a few minutes, is a certain degree of hyperæmia, lasting longer according to the duration of the application. Continuing it, some swelling of the skin appears, and the irritation can go so far as to produce exudation of a clear serum. This irritative effect has led to its application to atonic sores and ulcers on which the disinfectant effect of the flame is soon appreciable, and which often heal after some sessions, each lasting about one hour. Naturally, this process of healing can be much accelerated by preparatory surgical treatment—curettement.

Suchier obtained very good results in the treatment of tuberculous and scrofulous keratitis. Here the violet flame is directed straight to the eyeball, at first only for a few seconds; afterwards, when the patients are accustomed to the irritation, for one or two minutes. Suchier reports even the disappearance of maculæ corneæ under its influence. Suchier also praises the treatment of eczema in its various forms by the flame; even in psoriasis he had good results. In the few cases that came under my care I could state the same favourable effect. In one case of chronic eczema in the left elbow, which had resisted for years all different kinds of treatment, four sittings were sufficient for a radical cure. In neuralgic pains the violet flame has a real sedative effect. This led Suchier to its application in cases of tabes and other nerve diseases. His results, which have not yet been published, are, according to a communication by letter recently received, rather astonishing: returns of knee-jerks, recovery of serious motor and sensory symptoms could be stated. The flame discharge in these cases particularly seems to affect those paths which, although attacked by the infection, are not completely degenerated or destroyed. In one case of Friedreich's disease in a female patient, aged about 40, very remarkable improvements were obtained. In primary lateral sclerosis the success was less brilliant, but even here improvement could be stated. Diseases of the grey substance of brain and cord seem to resist the treatment. Neuralgic pains are very successfully influenced by the violet flame.

Before passing to the use of the spark, I must mention a very curious effect of the flame on the Röntgen screen. Directing the flame to the sensitive coating of the screen, we see the same phosphorescence as when touched by X-rays. The direct collision of the charged ions with the sensitive coating renders it luminant. But now turning the flame to the reverse, we see the radiation penetrating the whole thickness of the screen and the sensitive coat again illuminating. Photographic paper and plates are in the same way affected by these rays, as I can show you by these specimens. Whether we have to do here with X-rays, kathode rays, or perhaps only charged ions passing the pores of the screen, is another question to be solved by physical research. Professor Lorentz, of Leyden, the famous promoter of the electron theory, to whom I showed this beautiful experiment, did not reject the idea of the presence of X-rays. He suggested some physical experiments to solve this problem, which, however, lie out of the sphere of the medical practitioner.

Coming now to the application of the static spark, it seems that the method meets with some difficulty in spreading through the therapeutical world. Probably the cause must be sought in the fact that the management of static machines is still very uncertain. Even the machines built according to the suggestions of Suchier have many important faults, but, as soon as we are in possession of perfect, strong and reliable instruments, the method will undoubtedly take its place in daily practice. Suchier has described the mode of treatment in several papers published in the *Wiener Klinik*,[1] the *Dermatologische Zeitschrift*,[2] and in the *Annales d'Electrobiologie et de Radiologie*. Dr. Jesionek, of Giessen, professor of dermatology, has investigated and practised the method, of which he gave an account in the *Münchener medizinische Wochenschrift*.[3] His results are in all respects equal to those of Suchier.

For the electrostatic treatment of lupus the process begins with thorough cleansing and disinfection of the parts to be treated. Under local or general anæsthesia the tuberculous granulations are removed by small but strong and sharp curettes, a work which, under unusual circumstances, may prove very difficult, as, for instance, in old, indurated cicatricial tissue. After the bleeding has ceased and the wound has become almost dry, the patient is connected with a metallic electrode in connexion with the negative pole of the machine. A

[1] 1904, xxx, p. 269.
[2] 1905, xii, p. 731.
[3] 1908, lv, pp. 1270, 1342.

pointed electrode connected with the positive pole is now placed on the healthy skin in the neighbourhood of the wound to be treated. The circuit is opened. Lifting the positive electrode from the skin at the distance of about 1 mm., we see the spark appear. The glass handle of the pointed electrode enables us to direct this spark on every part of the wound. In about five or ten minutes the wound gets covered by a dark brownish crust, surrounded by an anæmic ring of the healthy skin. As a rule, a little swelling of the surroundings of the wound follows the application, but it disappears within a few hours. Also some serum is often secreted, which should be absorbed with an aseptic tampon. As the wound is now completely dry, no bandage is required. The patient is ordered to leave the wound untouched under any circumstances. Usually within a few weeks the crust is loosened and rejected, meanwhile epidermization has taken place under it, and a flat, pink scar is left which, by the thickening of the epidermis layer in another few weeks, becomes entirely white. The application is not very painful, and, once set going, a certain amount of anæsthesia is produced. Even the weakest and most sensitive patients learn to stand it during the first sitting. Especially in scrofulodermia I found it to be of high value.

As to the duration of this sideration, as the process can be called, it is found by practice that a spot of the extension of about a shilling takes nearly half an hour. It is easily perceived that this cure takes much less time than Finsen's treatment; the difficulty is to bring the granulations within the reach of the curette, after which healing is almost certain. Not only to the skin is our treatment restricted. It is possible to use the spark also inside the cavities of the nose and mouth; therefore glass tubes, provided with a small copper wire, must be introduced. As the glass tubes, through the respiratory air-current, soon become damp and wet, we have to avoid their becoming conductors and to prevent the production of undesired sparks; this is of no difficulty within the mouth, but gives much trouble when operating within the nose. Occlusion of the nose by tamponnade during treatment is then necessary. Asking what may be the direct cause of the curative effect of the spark, it is obvious that the principal force in action must be the heat production. Take a piece of tinder or cork and treat it by the spark; smoke is immediately seen, indicating that it is burning. Even during the application on dry crusts of the skin, this combustion is revealed by smoke and by smell. Contrary to other heat applications, in our method the heat is continually created by means of the proximity of wound and electrode, which can be continued *ad infinitum* without any damage to the patient. Whether,

again, the speed of the ions, the stress of the current, and the light concur in the curative effect, I must leave as a question unsolved. Certainly in many cases of lupus Suchier's method equals Finsen's light treatment, often surpassing it in rapidity. Without doubt it must be regarded as valuable in our struggle against the terrible disease as our modern surgical, light, and Röngten methods, all of which perhaps in future may be superseded by the ingenious method of your illustrious compatriot Wright—I mean opsonotherapy.

To prevent the long flashes which may occur with inexperienced assistants or anxious and fidgety patients, I have constructed a kind of safety-valve by placing between the conducting wires an auxiliary variable air-gap. As soon as the distance of the electrodes from the patient surpasses that of the air-gap just mentioned, the spark is compelled to pass in this air-gap. To one particular application of the spark I must draw your attention—that is, the treatment of teleangectatic nævi of the face. Very fine results can be obtained especially in the so-called port-wine stains. A somewhat atrophic but normal-coloured skin is the only sign of the former state after treatment in this way.

It is possible to use the static current for the stimulation of the nervous system and the muscles, just in the same way as we use galvanic or faradaic currents. Here we have to state that the static current is not a constant one, like the galvanic, but must be considered as a continuous, pulsating, non-intermittent current. If we place two wet electrodes, as used for galvanization, on the skin, and open the circuit, the current is forced to pass through the body. The only sign by which this current is revealed is a slight reddening of the skin under the positive electrode. This current seems to be of no importance. Perhaps in very strong and heavy machines, as Dr. Hulst's, this effect might be more perceptible. If we put a pair of Leyden jars in the current, undulating contractions in the muscles are seen; but as experiments with these arrangements are very difficult, and unexpected discharges rather painful and terrifying, they are out of consideration. By supplying a variable air-gap to one of the wires we can produce an intermittent current, the effect of which is excitation of the nerves as well as of the muscles. The narrower the air-gap, the greater the number of interruptions; the wider the air-gap, the lower the number, but the stronger and more painful the contractions. By using, again, Leyden jars of a convenient size the effect can be strengthened up to a certain limit, beyond which the pain cannot be borne.

Although my experience is not very large in this matter, I have observed good effects in some cases of spinal and peripheral paralysis. One case of writer's cramp, existing for over four years, which had resisted several methods of treatment, was almost completely cured under electrostatic treatment of the medulla cervicalis, plexus bronchialis, and muscles of arm and fingers.

To close the enumeration of the different ways by which we can profit from static electricity, I draw your attention to it as a source of Röntgen rays. By connecting our negative pole to the kathode of the tube and the positive to the antikathode or anode, and opening the circuit, a bright and steady Röntgen light appears, supposing that a sufficient current is produced. However, one condition must necessarily be fulfilled: the tubes must be absolutely dry. It is easily understood that when the tube is damp or wet the glass will take on the functions of a conductor and allow the discharge to pass over, instead of through, the tube; by warming the tubes before use this can be easily obviated. As our current is characterized by very high tension, estimated to vary between thirty thousand and several hundred thousands of volts, and very low amperage, the quantity of Röntgen rays produced is much less than that produced by a big coil. I think this to be a special advantage for the use of X-rays in the treatment of skin diseases, the over-dosing being more readily avoided. For the treatment of deep-seated lesions our method is insufficient; also for radiography, for which a too-long exposure would be required. However, Dr. Hulst has been able to produce instantaneous radiographs of the chest by his gigantic installation.

For the application of X-rays to the face I place my tubes inside a lead-sheathed removable case, a hole in the front of which, provided with a set of diaphragms, allows the radiation to escape. By pressing the diseased spot to this diaphragm the patient takes the radiation. In some particular cases of lupus situated in the superficial layers of the skin, very good results were obtained in this way. Also cases of rodent ulcer in the face gave way under this treatment. One case of molluscum contagiosum is still under treatment, but distinctly improving. From absolute lack of personal experience I must leave the so-called Morton currents, induced static currents, out of discussion.

In closing my remarks, I hope to have convinced my audience that it is possible to utilize the static current in widely different conditions as easily as any other current. As the method, however, is still in its infancy, a fair trial in one of the great medical centres is highly desirable. To induce such a trial has been one of the motives of my presence here.

DISCUSSION.

The PRESIDENT (Dr. Sloan) said that, whilst there was a sort of boom in the matter of static electricity some years ago, it was now being almost universally neglected in this country. He still used static electricity, but only in the form of the static induced current. The results of his previous trial of other forms of it were disappointing. Probably that was the case with most of the members, and for that very reason they welcomed the paper. He believed that after the demonstration they would not have the same idea as they had previously entertained. He hoped to hear a good discussion; and perhaps those who had not had experience of the static treatment would give their experience, if any, of high-frequency treatment; because the latter seemed to act much in the same way as had been described by the reader of the paper, in the case of skin diseases. Since Dr. Reginald Morton recommended it to him three or four years ago, he had used high frequency very successfully for very obstinate skin diseases—cases for which the usual local applications did no good. When the brush was used, the current ought to be sufficiently strong to cause some pain and a slight dermatitis. In the case of boils and carbuncles, he had no doubt, from experience, that by applying a pointed vacuum electrode with a strong current the disease could be arrested. In one or two cases in which opening of a superficial abscess seemed to be called for, he applied the vacuum electrode, and in two or three days the abscess had disappeared. As to the *modus operandi*, was it a local bactericidal action, or was it due to auto-inoculation, brought about by the flushing of the part with blood, which brought the antitoxins to the seat of the disease, taking away also the toxins into the blood current, to be subsequently destroyed there? This state of active congestion permitted the phagocytes to get nearer to the seat of the disease, and enabled the blood fluids so to modify the bacteria as to render them an easier prey to the phagocytes. He believed that to be so in acne and eczema. From one case he had he thought the condition in the skin was sometimes an angeioneurosis, and that the current acted as a tonic on the vasomotor nerves. He had an interesting case of that in a lady, aged 30, who had had, since an attack of measles at six years of age, most annoying flushings of the face; the knowledge that she was to meet somebody would cause her to flush badly, as would also the taking of tea or coffee or the exposure to cold air. There was no acne, nor permanent erythema, nor dry eczema. He applied the vacuum electrode to the face twelve times. Three years afterward she saw the lady again, and she was strikingly improved in appearance. She admitted that all her trouble had gone since the electric applications. For producing contractions of muscles he attached great value to the static induced current. The contractions were painless. He had made recto-abdominal applications for obstinate constipation, with great benefit. The lecturer spoke of producing a favourable effect upon psoriasis. One of his (Dr. Sloan's) patients told him that he had had his

psoriasis treated in that way in Paris, but that the improvement was only moderate; and he would be glad if the reader of the paper would say precisely what the effect was on that disease in his experience.

Dr. CURTIS WEBB said that the method had obtained very little hold in this country, but since 1904 he had used it very extensively in his general practice, and on cases which had been sent to him by others. He had not had a great experience of the treatment in skin diseases, but in three or four cases of psoriasis he had had improvement, though they relapsed after a month or six weeks. Perhaps one of the reasons why static electricity had not taken a hold in this country was that the particular type of machine had too great drawbacks. His own machine was of the American type, enclosed in a glass case; since 1904 the glass case had not been opened more than once a year, for cleaning purposes, and he had not had any trouble with it. Our climate was unsuited to the open kind of machine. Even though the present machine shown was installed only that afternoon, and with great care, there was some delay before it began to work. The American enclosed type of machine seemed to give much better results. Ozonization had been mentioned, especially in connexion with phthisis. Dr. Muthu, of the Mendip Sanatorium, who had devoted considerable attention to the matter, had had excellent results from it. The proportion of ozone generated from the electrical breeze could scarcely be fairly compared with the open-air effect, because the air was breathed at all hours of the day, whereas the machine was applied only an hour or two per day. A particular field of usefulness was the Morton wave-current, which was by far the most important static modality. Some time ago he published in the *Lancet*[1] a paper on cases of chronic sciatica which had lasted eighteen months and which had been cured by that method, and these cases had resisted all other forms of treatment. Since that time he had accumulated over sixty cases of sciatica and other forms of neuritis, and by means of the Morton wave-current, applied with the insulated platform, very good results had ensued. One could not hope for the cure of toxæmia by it, but for the perineuritis the Morton wave-current was one of the most powerful means in the physician's armamentarium. He had been round several of the London hospitals recently; in some he had seen static machines, in others none. Some of those he saw had been allowed to fall into disuse, and evidently they were not much used. The author had spoken of the direct spark and brush. He (Dr. Curtis Webb) had always used the indirect, the patient being treated from the ungrounded pole of the machine. That produced excellent results, and the spark could be regulated to a nicety. After what he had seen that evening, he would certainly try the direct.

Dr. LEWIS JONES said that it was interesting to hear a paper on statistical methods, as of late these had rather fallen into disuse in this country. The difficulty was to obtain precise information as to the cure of disease by statical treatment. The chief need of electro-therapeutics was that it should

[1] *Lancet*, 1907, i, p. 85.

find a field in the treatment of serious or definite disease, and should not be so much confined to the production of general tonic effects, and so on, in neurasthenics or in those suffering from simple debility. For his part, he found that field of electro-therapeuties to be monotonous and unsatisfying. He was glad therefore to hear the writer of the paper deal with the treatment of lupus by the static brush-discharge. There was no room to doubt that this constituted a valuable mode of treatment, and it was possible that the traces of nitric acid and the ozone formed were the active agents in bringing about a good result. It had been shown by Foulerton and Kellas that these were the probable agents of bactericidal effects in the similar brush-discharges of the high-frequency apparatus.

Dr. F. H. HUMPHRIS, remarking on the difficulty of using the static machine, said that a properly manufactured machine in a good case should not need to be opened more than once or twice a year, and it should be as easy to turn on the current as in an ordinary faradaic battery. It was useful in very many skin diseases. His own experience was that cases of acne, old ulcers, chronic eczema and such conditions, could be relieved almost immediately, and good results were seen in a week. He agreed with Dr. Curtis Webb that for neuritis, especially sciatica, the Morton wave-current was good, if the case had not gone as far as the formation of adhesions, for which surgery was the only relief. The pain could be relieved by this form of electricity, and in most cases cured. For lumbago and other myalgias it was almost a specific, giving relief within twenty minutes. For recent sprains and fracture, the brush-discharge was a valuable therapeutic measure, the pain practically disappearing in ten minutes, while the swelling and blue discoloration due to the extravasated blood would gradually disappear. It sounded a brave thing to talk about relieving locomotor ataxy, but he had no doubt that static electricity would give relief to it and improve the walking, for this he had himself done, though admittedly nothing would restore cells which had once been destroyed. Still, the method relieved deep-seated congestion and prevented the destruction of further cells; moreover, he suggested that there might be other cells in the spinal cord ready to take on the function of those which had been destroyed, if the destroying agent—i.e., the congestion—were removed. The President had asked for the *modus operandi* of the method (the direct spark). He (the speaker) thought it was more than heat and more than nitric acid. First, there was a profound contraction of the part to which the spark was applied, and there occurred not only a contraction which could be seen, but a protoplasmic contraction. In the case of lupus the cells were forced to the surface, and when they got there the formation of nitric acid, and probably of nascent ozone, occurred, and that was antiseptic. He thought the reason that many men had not found the method good was that they turned on the static machine and expected certain results to happen, without taking into account the kind of case or the voltage or the amperage. Only in America, probably, was there an apparatus for registering the voltage of a static machine. A competent static machine should give out not less than

90,000 volts, and should be capable of 750,000 volts, and should show on a properly constructed milliampermeter ½ ma. It would not serve as well as a coil for taking radiographs, but the man who went in for electro-therapy had enough to do to deal with treatment.

Dr. PIRIE said that eight years ago, when he went over to America, there was a boom in regard to static machines there, and again six years ago he noticed they retained their reputation. But when he was there in the year just ended, there did not seem to be anything like the same enthusiasm. He went to five hospitals, in none of which was there a static machine; the coil was the only form which seemed to be in use. Static machines seemed to have taken a back seat.

Dr. HUMPHRIS rose again because his experience in America had been so utterly opposed to Dr. Pirie's, and he thought he had had a better opportunity than that gentleman for judging, since he had lived ten years in the country. He thought the use of such machines in America had grown 50 per cent. in the last five or six years. The Electro-Therapeutical Society of the United States, of which he was a Fellow, published a journal in which to-day articles on static electricity formed the most important part. The manufacturers were now turning out hundreds of machines where they were formerly turning out tens, and almost each month saw a new form of machine put on the market or an old form improved. Next time Dr. Pirie went to America he would give that gentleman some addresses, and he would be able to satisfy himself on the point. Dr. Humphris much regretted at having to rise to contradict especially a gentleman whose work was so well known as Dr. Pirie's, but he felt it was not fair to the Society to carry away views upon the subject of static electricity in the United States which he believed were erroneous.

Dr. REGINALD MORTON replied, at the request of Dr. Voorthuis, as his knowledge of English did not, in that gentleman's opinion, enable him to do justice to the discussion. He (Dr. Morton) would take the occasion to say a little on his own account. He was not a specialist in skin diseases, but, like other electro-therapeutists, he occasionally had such cases sent to him, and he had found that the vacuum electrode was one of the most useful and successful things which he had ever employed. That applied especially to such a disease as acne vulgaris. The first case of the kind he had had was on the face of a lady who had been troubled with the condition from childhood, and in her case, though she was otherwise a handsome woman, it was complicated by pitted scars. The first time he used the treatment he did so in desperation, after telling the patient frankly it was in the nature of an experiment. The condition began to clear up almost instantaneously, and in a fortnight one would scarcely have known there had been anything the matter except for the old scars. Another case was that of an attendant at a bath who was in danger of being discharged because he had the disease on the shoulders and it was unsightly. He treated that patient in the same way, and in a fortnight the condition had vastly improved, yet it was of fifteen months' duration. His aim was to

produce a mild yet definite hyperæmia over the area. If a spot was pustular he sparked it, and on the next visit the lesion was found to have withered away. In reply to the discussion, Dr. Voorthuis said the action he got with his flame-discharge was of the same kind as with the high frequency and the vacuum electrode. Also, he thought the action was a local bactericidal one. With regard to psoriasis, he believed the method described was no more efficacious than the X-rays, but he thought the effect produced lasted longer. The author had had no experience of the Morton current, but hoped soon to have. He had found the method valuable in the cure of acne, and for the relief of pain but had not tried it in locomotor ataxy. The lecturer did not understand what Dr. Humphris meant by protoplasmic contraction. His own view—and he did not mean any offence in saying it—was that it existed only in imagination. Dr. Voorthuis wished to thank the Section very heartily for its kindness and for the discussion.